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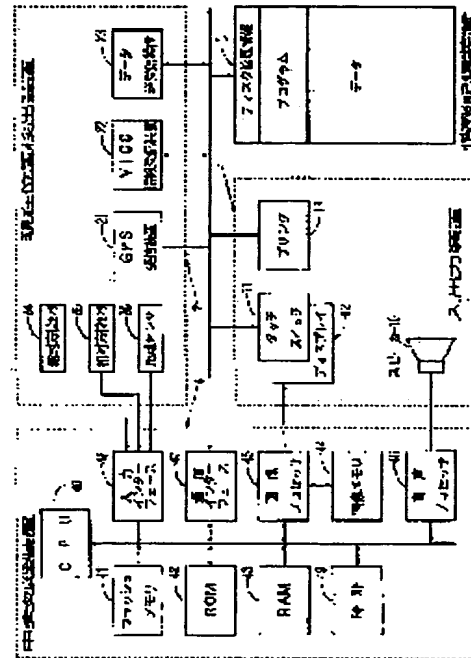
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## (54) NAVIGATOR FOR VEHICLE AND STORAGE MEDIUM

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a navigator by which whether it is required to guide a vehicle up to a passage point or not is selected by a method in which a route search means is provided, a judgment area which can judge whether it is required to guide the vehicle up to the passage point or not is set at the passage point which is set by a point setting means and the present position of the vehicle is judged to be within the area.

**SOLUTION:** A program is read out, from an information storage device, into a CPU 40 at a central processor 4, and a route guidance program is started. A target name such as a place name, an installation name or the like, a telephone number, an address, a registration point, a road name and the like are used, and a destination is set. Then, a present position is detected by a present-position detecting device 2, its peripheral map is displayed by making use of the present position as the center, the name or the like of the present position is displayed, and a route up to the destination from the present position is searched. When the route is decided, the present position is tracked by the present-position detecting device 2, and the route is guided and displayed repeatedly until the destination is searched. When a detour setting operation is input before the destination is searched, a search area is set, and the route is searched again.



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**CLAIMS**


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**[Claim(s)]**

[Claim 1] Navigation equipment for cars characterized by guidance to a shunt enabling selection of being the need in the navigation equipment for cars shown in accordance with a path to the shunt which pursued the current position and was decided beforehand, and the destination on condition that the self-vehicle location reached in predetermined distance to the shunt.

[Claim 2] A current position detection means to detect the current position, and the point setting means for setting up a shunt or the destination, The path planning means for computing the path which reaches the destination through a shunt, and a judgment area setting means to set up judgment area for guidance to a shunt to enable selection of being the need to the shunt set up by said point setting means, Navigation equipment for cars equipped with the control means by which guidance to a shunt controls selectable whether it is the need on condition that the current position detected by said current position detection means was judged to be in said judgment area.

[Claim 3] A current position detection means to detect the current position, and the point setting means for setting up a shunt or the destination, The 1st judgment area for judging whether it passed through the shunt set up by the path planning means and said point setting means for computing the path which reaches the destination through a shunt, A judgment area setting means to set up the 2nd judgment area for guidance to a shunt to make it selectable whether it is the need, While controlling selectable whether guidance to a shunt is required on condition that the current position detected by said current position detection means is in the 2nd judgment area Navigation equipment for cars equipped with the control means controlled to judge that it passed through the shunt on condition that said current position is in the 1st judgment area, and to perform the following guidance.

[Claim 4] A current position detection means to detect the current position, and the point setting means for setting up a shunt or the destination, The 1st judgment area for judging whether it passed through the shunt set up by the path planning means and said point setting means for computing the path which reaches the destination through a shunt, the 1st judgment area — containing — this — with a judgment area setting means to set up the 2nd judgment area which is area larger than the 1st judgment area While controlling selectable whether guidance to a shunt is required on condition that the current position detected by said current position detection means is in the 2nd judgment area and it strayed off the path Navigation equipment for cars equipped with the control means controlled to judge that it passed through the shunt on condition that said current position is in the 1st judgment area, and to perform the following guidance.

[Claim 5] It is navigation equipment for cars characterized by the thing which search for a new path, and for which said path planning means is controlled to search in equipment any or given in 1 term among claims 2-4 while it eliminates the set-up shunt that guidance to a shunt is not required for said control means, on condition that it was chosen.

[Claim 6] In the storage which memorized the program which the current position is pursued and is shown by computing a path to the shunt decided beforehand and the destination As opposed to the shunt by which carried out a point setup of a shunt or the destination, and a point setup was stored and carried out The storage which memorized the program whose guidance to a shunt controls selectable whether it is the need on condition that judgment area for guidance to a shunt to enable selection of being the need was set up and the current position was judged to be in said judgment area.

[Claim 7] In the storage which memorized the program which the current position is pursued and is shown by computing a path to the shunt decided beforehand and the destination The 1st judgment area for carrying out a point setup of a shunt or the destination, and judging whether it stored and passed through the shunt by which a point setup was carried out, Set up the 2nd judgment area for guidance to a shunt to make it selectable whether it is the need, and while controlling selectable whether guidance to a shunt is required on condition that the current position is in the 2nd judgment area The storage which memorized the program controlled to judge that it passed through the shunt on condition that said current position is in the 1st judgment area, and to perform the following guidance.

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[Translation done.]

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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the storage which contained the program which processes navigation equipment for cars, a shunt judging, etc. which set up the destination, a shunt, etc. and perform root guidance.

[0002]

[Description of the Prior Art] He registers beforehand the point which setting up in a telephone input, 50 sound input, etc., and carrying out root guidance is performed, and should set up the destination, a shunt, a facility to see, etc. in this case as a memory point, and is trying to use the registered point for a setup of the destination or a shunt in navigation equipment conventionally.

[0003] For example, if alter operation is carried out when cursor is moved and it comes to the target point (memory point) by a remote control unit etc. on the initial screen format of navigation equipment When the destination, a shunt, memory, and the mode alternative of a their present location are displayed as shown in drawing 10 , and memory is chosen here, as the facility nearest to a cursor location is searched and it is shown in drawing 11 If the facility name "ABC" is displayed with a registration number, a mark, the telephone number, etc. and pushes a memory carbon button, this will be registered as a memory point. In this way, you can make the registered point shown a list table, for example, it is made to be shown a list table like drawing 10 , and if a destination carbon button is pushed and a memory point will push the shunt carbon button as a destination, a memory point will be set up as a shunt.

[0004]

[Problem(s) to be Solved by the Invention] By the way, as shown in drawing 12 , when Shunt P is set up in the guidance root, if it runs the 1st root R1 and enters from Shunt P in the circle of a radius r (passage judging area), for example, a circle with a radius of 50m, as shown in drawing 12 (a), the section which it judges with having passed through Shunt P, and is shown is switched to the section of the 2nd root R2. Thus, unless a self-vehicle advances into the passage judging area very near the shunt, it does not judge with having passed through the shunt. That is, when a root blank is started without approaching into passage judging area as shown in drawing 12 (b), the root linked to the 1st root RI to Shunt P will be searched. Therefore, even if it is going to switch to guidance on the 2nd root, without rescheduling and passing along Shunt P before passage judging area If it remains as it is, the root linked to the 1st root RI is searched, and the root linked to the 2nd root R2 is not searched, but it is necessary to perform re-retrieval by actuation by the menu in an initial screen format again to switch to guidance by the 2nd root R2.

[0005] Thus, an operator does not necessarily pass along the set-up shunt. For example, although the shunt was set up as a break point while reaching to the destination, since the break was taken before the set-up shunt, the case where he wants to go to the destination, without visiting the shunt arises. In this case, with conventional equipment, a shunt is eliminated, or the actuation for newly searching for the path to the destination is needed, and there is a problem that actuation is complicated.

[0006] It aims at offering the storage which this invention is for solving the above-mentioned technical problem, and memorized the program which performs the navigation equipments [ without advancing into the passage judging area near a shunt, when the shunt is set up on the guidance root ] for cars which can be easily switched to guidance in the next section of a shunt, and these processings.

[0007]

[Means for Solving the Problem] The navigation equipment for cars of this invention pursues the current position, and in the navigation equipment for cars shown in accordance with a path to the shunt decided beforehand and the destination, on condition that the self-vehicle location reached in predetermined distance to the shunt, it is characterized by guidance to a shunt enabling selection of being the need. Moreover, a current position detection means by which this invention detects the current position and the point setting means for setting up a shunt or the destination, The path planning means for computing the path which reaches the destination through a shunt, and a judgment area setting means to set up judgment area for guidance to a shunt to enable selection of being the need to the shunt set up by said point setting means, On condition that the current position detected by said current position detection means was judged to be in said judgment area, guidance to a shunt is characterized by having the control means which controls selectable whether it is the need. Moreover, a current position detection means by which this invention detects the current position and the point setting means for setting up a shunt or the

destination, The 1st judgment area for judging whether it passed through the shunt set up by the path planning means and said point setting means for computing the path which reaches the destination through a shunt, A judgment area setting means to set up the 2nd judgment area for guidance to a shunt to make it selectable whether it is the need, While controlling selectable whether guidance to a shunt is required on condition that the current position detected by said current position detection means is in the 2nd judgment area It is characterized by having the control means controlled to judge that it passed through the shunt on condition that said current position is in the 1st judgment area, and to perform the following guidance. Moreover, a current position detection means by which this invention detects the current position and the point setting means for setting up a shunt or the destination, The 1st judgment area for judging whether it passed through the shunt set up by the path planning means and said point setting means for computing the path which reaches the destination through a shunt, the 1st judgment area — containing — this — with a judgment area setting means to set up the 2nd judgment area which is area larger than the 1st judgment area While controlling selectable whether guidance to a shunt is required on condition that the current position detected by said current position detection means is in the 2nd judgment area and it strayed off the path It is characterized by having the control means controlled to judge that it passed through the shunt on condition that said current position is in the 1st judgment area, and to perform the following guidance. [0008] Moreover, this invention is characterized by the thing which search for a new path and for which said path planning means is controlled to search while it eliminates the set-up shunt that guidance to a shunt is not required for said control means, on condition that it was chosen.

[0009] Moreover, the storage which memorized the program of this invention In the storage which memorized the program which the current position is pursued and is shown by computing a path to the shunt decided beforehand and the destination As opposed to the shunt by which carried out a point setup of a shunt or the destination, and a point setup was stored and carried out Judgment area for guidance to a shunt to enable selection of being the need is set up, and on condition that the current position was judged to be in said judgment area, it is characterized by guidance to a shunt controlling selectable whether it is the need. Moreover, the storage which memorized the program of this invention In the storage which memorized the program which the current position is pursued and is shown by computing a path to the shunt decided beforehand and the destination The 1st judgment area for carrying out a point setup of a shunt or the destination, and judging whether it stored and passed through the shunt by which a point setup was carried out, Set up the 2nd judgment area for guidance to a shunt to make it selectable whether it is the need, and while controlling selectable whether guidance to a shunt is required on condition that the current position is in the 2nd judgment area It is characterized by controlling to judge that it passed through the shunt, on condition that said current position is in the 1st judgment area, and to perform the following guidance.

[0010]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained. Drawing 1 is drawing showing one example of the navigation equipment for cars with which this invention is applied. The navigation equipment for cars concerning this invention As shown in drawing 1, the information about path guidance The information about I/O device 1 outputted and inputted and the current position of a self-car The information storage device 3 and path planning processing on which the current position detection equipment 2 to detect, the data for navigation required for calculation of a path, the guidance data of a display/voice required for path guidance, a program (application and/or OS), etc. are recorded, and a display / voice guidance processing required for path guidance While carrying out, it consists of central processing units 4 which control the whole system. First, each configuration is explained.

[0011] I/O device 1 inputs the destination or is equipped with the function which carries out the printed output of the data after processing etc. while directing navigation processing to a central processing unit 4 by an operator's volition so that guidance information can be outputted with voice and/or a screen by the way in which an operator is the need. It has the touch switch 11 and actuation switch which input the destination into the input section with the telephone number, the coordinate on a map, etc., or request path guidance to it as a means for realizing the function. Of course, input units, such as a remote controller, are sufficient. Moreover, a screen display of the input data is carried out to the output section, or it is equipped with the loudspeaker 16 which outputs with voice the printer 13 and path guidance which carry out the printed output of the display 12 which displays path guidance automatically in the pictures according to an operator's request, the data processed with the central processing unit 4, or the data stored in the information storage device 3.

[0012] Here, the record card reader for reading the data recorded on the voice recognition unit, IC card, and magnetic card for making voice input possible can also be added. Moreover, data required for navigation can be stored and the data communication unit for exchanging data between the information center which makes information offer through a communication line by demand of an operator, and the information sources, such as an electronic notebook the data of operator's props, such as map data and destination data, are beforehand remembered to be, can also be added.

[0013] The display 12 is constituted by the color CRT and the electrochromatic display indicator, and while carrying out the color display output of all the screens required for navigation, such as the routing screen and section drawing side based on map data and guidance data which a central processing unit 4 processes, and a crossing drawing side, the carbon button for performing setup of path guidance and switch actuation of the guidance in a course guidance and a screen is displayed on this screen. Color display especially of the passage crossing information, such as a passage crossing name, is carried out to a section drawing side in pop up at any time.

[0014] An operator can check the present location of a self-car by seeing a block plan by being prepared in the

instrument panel near the driver's seat, and this display 12 can acquire the information about a future path. Moreover, corresponding to the display of a feature button, the touch switch 11 is formed in the display 12, and it is constituted so that the above-mentioned actuation may be performed based on the signal inputted by touching a carbon button. Although the input signal generating means which consists of this carbon button, touch switch, etc. constitutes the input section, that detailed explanation is omitted here.

[0015] The GPS receiving set 21 with which the current position detection means 2 receives information using the current position satellite navigation system (GPS) of a car, By using the VICS information receiving set 22 for information coming to hand using an FM multiplex broadcast, an electric-wave beacon, an optical beacon, etc., a cellular phone, a personal computer, etc. The data transmitter-receiver 23 for communicating an information center (for example, ATIS), the other car, and information bidirectionally, Advance bearing of a car For example, the absolute bearing sensor 24 absolutely detected in the bearing by using earth magnetism, Advance bearing of a car For example, a steering sensor and the relative bearing sensor 25 detected by relative bearing by using a gyroscope sensor, For example, it is equipment consists of distance robots 26 which detect the mileage of a car from the rotational frequency of a wheel, and detects the information which is the information about transit of a car concerning the current position of a car in transmitting and receiving a traffic information and traffic information, for example \*\*\*\*, or transmit and receive the information about the current position further.

[0016] An information storage device 3 is the external storage which memorized the program and data for navigation, for example, consists of a CD-ROM. The program for carrying out the program which controls selectable whether the program for performing the program for processing path planning etc. and the passage judging of a shunt given in this example and guidance to a shunt are required for a program or the processing program shown in a flow chart given in this example, a display output control required for path guidance, and voice output control required to voice guidance and data required to it, and display information data still more nearly required for path guidance and a map display are stored. Moreover, data consist of files, such as map data, retrieval data, guidance data, map matching data, destination data, and registration point data, and all data required for navigation equipment are memorized. In addition, this invention can store only data in CD-ROM, and a program can be applied also to the thing of the type stored in a central processing unit.

[0017] The program check of the flash memory 41 which a central processing unit 4 reads CD-ROM of CPU40 and an information storage device 3 which performs various data processing to a program, and is stored, and a flash memory 41, ROM42 which stored the program (program reading means) which updates, the point coordinate of the set-up destination, It is based on the image memory 44 with which RAM43 which stores temporarily the data under the path guidance information for which it was searched and data processing, such as road name code No., and the image data which uses it for a screen display to a display were memorized, and a display output-control signal from CPU40. Image data from an image memory 44 The image processor 45 which performs ejection and an image processing and is outputted to a display, the voice read from the information storage device 3 based on the voice output control signal from CPU, A phrase, the text collected into one, A sound etc. is compounded. It changes into an analog signal. To the sensor input interface 48 for incorporating the sensor signal of the voice processor 46 outputted to a loudspeaker 16, the communication interface 47 which exchanges the I / O data based on a communication link, and current position detection equipment 2, and internal DAIAGU information, the date and time amount It has the clock 49 for entering etc. Here, path guidance is performed by the screen display and the voice output, and the existence of a voice output is constituted so that an operator can choose.

[0018] In addition, the program which performs the above mentioned update process may be stored in external storage. All the programs for performing program concerning this invention and other navigation may be stored in CD-ROM which is external storage, and these all [ a part or ] may be stored in ROM42 by the side of a body. [ all ]

[0019] Various navigation functions are realized by inputting and carrying out data processing of data and the program which were memorized by this external storage to the central processing unit of the body of navigation equipment as an external signal.

[0020] The navigation equipment concerning this invention contains the comparatively mass flash memory 41 for reading a program from CD-ROM of external storage as mentioned above, and ROM42 of the small capacity which stored the program (program reading means) which performs starting processing of CD. Even if a power source cuts a flash memory 41, storage information is held, that is, it is the storage means of a non-volatile. And the program check which started the program of ROM42 which is a program reading means as starting processing of CD, and was stored in the flash memory 41 is performed, and the disk management data of CD-ROM of an information storage device 3 etc. are read. Loading processing (update process) of a program is performed judging from the condition of this information and a flash memory 41.

[0021] Drawing 2 shows the example of a configuration of the main data files stored in CD-ROM3 shown in drawing 1. Drawing 2 (A) shows the guide passage way data file in which data required in order to compute a path with a path calculation means and to perform path guidance were stored, and consists of each data of the address of the address of a road number, die length, road attribute data, and configuration data, size, and guidance data, and size to each of a several n road. said road number — every road during the branch point — a direction (an outward trip, return trip) — it is set up independently. Said configuration data have the coordinate data which consists of the east longitude and the north latitude to node several m each, when each road is divided by two or more nodes (knot), as shown in drawing 2 (B).

[0022] Said guidance data consist of each data of the address of the address of a crossing (or junction) name, notes data, road name data, and road name voice data, size, and destination data, and size, as shown in drawing 2 (C).

[0023] Said destination data consist of a destination road number, a destination name, the address of destination name voice data, size and direction data of a destination, and transit guidance data, as shown in drawing 2 (D). Said destination name also contains the direction name. Moreover, the direction data of a destination are data in which the information on an invalid (the direction data of a destination are not used), needlessness (it does not show around), rectilinear propagation, the right, the direction of the diagonal right, the direction that returns to the right, the left, the direction of the diagonal left, and the direction that returns to the left is shown.

[0024] Drawing 3 is drawing for explaining the flow of the whole system of the navigation equipment concerning this invention. A program is read into CPU40 of a central processing unit 4 from an information storage device 3, and the program of path guidance is started. While setting up the destination using target names, such as the name of a place and a facility name, the telephone number and the address, a registration point, a road name, etc. (step S1), next current position detection equipment's 2 detecting the current position and displaying the circumference map centering on the current position, the name of the current position etc. is displayed (step S2), and the path planning from the current position to the destination is performed (step S3). Performing the current position trace by current position detection equipment 2, if a path is decided, path guidance and a display will be repeated and will be performed until it arrives at the destination (step S4). When the input of a stopping on the way setup is before arriving at the destination, retrieval area is set up, re-retrieval in the retrieval area is performed, and path guidance is repeated and is performed until it arrives at the destination similarly.

[0025] Drawing 4 is drawing showing registration point DS. As for registration point data, the road number which the coordinate of a registration point, registration point name data, the registration point address, and a registration point face is stored. In order that registration point name data may enable the input for example, by 50 sounds, reading of a registration point is stored, and as for the thing which displays [ kanji- ] or displays [ katakana- ] as a registration point list at the time of retrieval, reading of the kanji or katakana etc. is stored. Moreover, registration point address data store the address of a registration point in a local hierarchy target like a prefecture, a city, and a town.

[0026] Next, drawing 5 - drawing 9 explain the judgment approach of the shunt of this invention. Drawing 5 is drawing explaining the shunt judging approach of this invention. In addition, a point setup of a shunt or the destination is carried out by the approach as shown in drawing 10. When Shunt P is set up on the guidance root and the 1st root R1 and the root on the basis of a shunt are made into the 2nd root R2 so that it may illustrate, [ root / to a shunt ] Let the inside of the circle of the passage judging area and the radius R ( $R > r$ , for example, hundreds of m - several km) centering on P points (the 2nd field) be passage judging check area. [ inside / of the circle of the radius r centering on P points / (the 1st field) ] The 1st field is the passage judging area explained by drawing 12, and when a self-vehicle enters in this area, or when it enters in this area and separates from the 1st root, it judges with having passed through Shunt P. When the 2nd field was passage judging check area set up in this invention, it enters in this area when it enters in this area, and it separates from the 1st root " — does it switch to guidance to the next point? If the message of " is displayed, and a carbon button is pushed or it operates by remote control, it will judge with having passed through Shunt P, the connection root to the 2nd root R2 will be searched, and it will be switched to guidance on the 2nd root. When not choosing a guidance switch on the 2nd root, the root linked to the 1st root R1 is searched, and guidance based on it is performed. That is, selection of whether it returns to the root of \*\*\*\* 1 or for a shunt to be passed and to go to the 2nd root has come to be only able to perform even switch actuation, without performing troublesome actuation of returning to a menu screen like before and performing re-retrieval, if it goes into passage judging check area.

[0027] Drawing 6 is drawing for explaining the case where it goes on to the 2nd root, without passing along Shunt P. if a self-vehicle goes into the 2nd field, or when it went into the 2nd field and separated from the 1st root R1, it mentioned above — as — " — does it switch to guidance to the next point? The message of " is displayed. Then, if a switch of guidance is chosen by switch actuation, the root linked to the 2nd root will be searched and guidance based on a retrieval result will be performed.

[0028] Drawing 7 advances to the 2nd field, and it separates from it from the 1st root R1, and it is an explanatory view in the case of returning. if it advances into passage judging check area and separates from the 1st root R1 — " — does it switch to guidance to the next point? The message of " is displayed. Then, if it chooses not switching guidance by switch actuation, the root linked to the 1st root R1 will be searched, and guidance based on a retrieval result will be performed.

[0029] Drawing 8 is drawing explaining the case where passed through the 2nd field and it goes into the 1st field. It judges with having passed through Shunt P, when it entered in passage judging area, or when it entered in passage judging area and separated from the root, and is switched to guidance in the next section (the 2nd root R2).

[0030] Drawing 9 is drawing explaining the passage judging processing flow of the shunt of this invention. In passage judging processing of this invention, using the area penetration flag f which shows whether the self-vehicle advanced into passage judging area and passage judging check area, the area penetration flag f is seen and the message indicator of a passage judging or a guidance switch in the next section is judged. A start of root guidance sets the area penetration flag f to 0 first (step 1). Current position detection equipment 2 (refer to drawing 1) detects a self-vehicle location, and if a self-vehicle location is in passage judging check area (the 2nd field) and it will be detected that considered as the area penetration flag  $f = 1$  (step 2Y, step 3), ran further, and the self-vehicle location entered in passage judging area (the 1st field), it will consider as the area penetration flag  $f = 2$  (step 4Y, step 5). If it has not arrived at passage judging check area, it is the area penetration flag  $f = 0$ . Subsequently, it judges whether it is the off root (it separates from the 1st guidance root which reaches a shunt) (step 6). If it has

not separated from the 1st guidance root (step 6N), while having repeated the above processing and having separated from the 1st guidance root is detected. If it is the area penetration flag  $f=0$ , retrieval processing of the root linked to the 1st guidance root will be performed (step 6Y, step 7Y, step 12). If it separates from the 1st guidance root, and it is the area penetration flag  $f \neq 0$  and it is the area penetration flag  $f=1$  (step 6Y, step 7N, step 8Y), since the off root is carried out in passage judging check area. The message of "whether to switch guidance to the next section" is displayed on an initial screen format (or whether it tells about with voice). you may tell you about by concomitant use of a screen and voice — if a guidance switch in the next section is chosen by switch actuation (step 9Y), root retrieval linked to the 2nd guidance root on the basis of a shunt will be performed (step 10), and guidance will be switched to the next section (step 11). When not choosing a guidance switch of the next section by switch actuation, retrieval processing of the root linked to (step 9N) and the 1st guidance root will be performed, and the current section will be shown (step 12, step 13). Moreover, in step 8, since it entered in passage judging area and the off root was carried out when it was  $f=1$ ,  $f=2$  [ i.e., ], it judges with having passed through the shunt and is switched to guidance in the next section (step 8N, step 11). In addition, in this processing flow of drawing 9, without being carried out on condition that a root blank, on condition that it entered in passage judging area or passage judging check area, it may be made to be carried out on condition that the off-root of step 6, but to perform subsequent processing.

[0031]

[Effect of the Invention] it becomes that it is possible in carrying out by actuation with easy selection of whether to pass a shunt even if it does not go into passage judging area, when another passage judging check area is set to the outside of passage judging area and a self-vehicle goes into passage judging check area according to this invention as mentioned above, and it becomes that it is possible in it being markedly alike and raising the user-friendliness of a case so that he may want to carry out the reschedule do not pass a shunt.

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[Translation done.]